

# Redescription and validation of *Alphestes afer* as an amphi-Atlantic grouper species (Perciformes: Serranidae)

by

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**ABSTRACT.** - *Alphestes afer* (Bloch, 1793), a common western Atlantic species of grouper, was described from the coast of Guinea, West Africa. The type locality has long been regarded as erroneous, and the presence of this species in the eastern Atlantic has gone unnoticed since its original description. A morphological comparison of the holotype with 44 specimens from various western Atlantic and Caribbean localities indicates that the holotype is indeed conspecific with western Atlantic specimens. Recently (March, 2004) a specimen bearing strong resemblance to *A. afer* was photographed at São Tomé city fish market on São Tomé Island (Gulf of Guinea; West Africa), and a tissue sample was taken for genetic analysis. Mitochondrial and nuclear DNA evidence indicates that this specimen is conspecific with western Atlantic specimens. The species is herein re-described.

**RÉSUMÉ.** - Nouvelle description et validation d'*Alphestes afer*, espèce de mérou amphi-atlantique (Perciformes : Serranidae).

*Alphestes afer* (Bloch, 1793), espèce de mérou commune de l'Atlantique occidentale, a été décrite de la côte de Guinée, Afrique occidentale. La région de capture du type a longtemps été considérée comme erronée, et la présence de cette espèce dans l'Atlantique oriental est passée inaperçue depuis sa description originale. Une comparaison morphologique de l'holotype avec 44 spécimens de l'Atlantique occidentale et de la région des Antilles indique que l'holotype est conspécifique avec les spécimens de l'Atlantique occidentale. Récemment (mars 2004) un spécimen ressemblant fortement à *A. afer* a été photographié au marché aux poissons de la ville de São Tomé, de l'île de Tomé (golfe de Guinée, Afrique occidentale), et un échantillon de tissu a été prélevé pour analyse génétique. L'étude de l'ADN mitochondrial et nucléaire indique que ce spécimen est conspécifique avec les spécimens de l'Atlantique occidentale. Une nouvelle description de l'espèce est donnée.

Key words. - Serranidae - *Alphestes afer* - ASE - Gulf of Guinea - São Tomé - West Africa - Shore fish - Taxonomy.

The genus *Alphestes* comprises three species of serranid fishes commonly known as mutton hamlets. The three species in the genus (*A. afer* heretofore known from the western Atlantic; *A. immaculatus*, and *A. multiguttatus* both from the tropical eastern Pacific) form a monophyletic group that is closely related to the genus *Dermatolepis* (Craig *et al.*, 2004). These relatively small grouper species rarely reach sizes in excess of 30 cm total length. The mutton hamlet, *Alphestes afer* (Bloch, 1793) has been recorded from Bermuda south to Brazil. Originally described from the coast of Guinea by Bloch (1793) as *Epinephelus afer*, this species has not been reported from the eastern Atlantic since the original description, and the type locality has long been regarded as erroneous (Smith, 1971; Heemstra and Randall, 1993).

On 4 March 2004, P. Wirtz observed a grouper in a fish market on São Tomé Island (Gulf of Guinea, western Africa)

that was unfamiliar to him. He photographed the fish and obtained a tissue sample for genetic analysis (Fig. 1). The fish was identified from the photograph as *Alphestes afer* by P.C. Heemstra and an examination of DNA sequences by M.T. Craig indicated that the specimen was conspecific with western Atlantic specimens of *Alphestes afer* Bloch, 1793. Herein, we re-describe Bloch's *Alphestes afer* and confirm its amphi-Atlantic distribution.

## MATERIAL AND METHODS

Counts and measurements were performed following Hubbs and Lagler (1958) and Heemstra and Randall (1993). Institutional abbreviations follow Leviton *et al.* (1985) and Eschmeyer (1998). For the São Tomé specimen, DNA

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Table I. - Meristic counts and measures for 24 specimens of *Alphestes afer*. \*: holotype. [*Comptes et mesures méristiques pour 24 spécimens d'Alphestes afer.*]

Catalog #	SL	TL	Body Depth	Depth of CP	Snout	Orbit	D	A	Pc.	GR Upper	GR Lower	GR Total	LLS	LSS
ANSP 105415 6	28	37	10.5	4.0	2.5	3.0	XI, 18	III, 9	16	7	17	24	61	78
ANSP 121416 2	33	42	14.0	4.0	2.5	4.0	XI, 19	III, 9	16	7	16	23	-	
UNSM 247245	36	44	13.5	5.0	3.5	4.0	XI, 18	III, 9	16	7	16	23	63	81
ANSP 121416 1	57	71	20.5	6.5	4.0	7.0	XI, 18	III, 9	16	7	17	24	66	88
ANSP 103289 3	62	79	23.0	8.0	6.0	6.5	XI, 18	III, 9	16	7	16	23	55	73
ANSP 105415 4	63	78	24.0	8.0	4.5	6.5	XI, 18	III, 9	16	7	16	23	62	78
ANSP 105415 5	68	82	25.0	8.0	5.5	7.5	XI, 19	III, 9	16	7	17	24	60	81
ANSP 105415 2	72	83	25.5	8.5	5.5	7.0	XI, 18	III, 9	16	7	15	22	60	75
ANSP 113327 4	72	89	27.5	8.5	5.0	6.0	XI, 18	III, 9	17	8	17	25	63	83
ANSP 105415 3	72	89	25.5	8.5	5.0	7.0	XI, 18	III, 10	15	7	16	23	63	86
ANSP 113327 3	72	91	26.0	8.5	5.5	7.0	XI, 18	III, 9	16	8	17	25	65	88
ANSP 105415 1	76	92	28.5	9.0	5.5	7.5	XI, 19	III, 10	16	7	16	23	66	78
ANSP 103289 2	77	96	31.0	10.0	6.5	6.5	XI, 18	III, 9	17	7	16	23	66	80
USNM 235696 8	84	110	30.5	9.5	8.0	8.0	XI, 18	III, 10	16	6	16	22	65	86
USNM 235696 1	96	113	35.5	12.0	8.5	9.0	XI, 18	III, 9	16	5	17	22	63	81
ANSP 103289 1	120	150	48.5	16.0	9.5	10.0	XI, 19	III, 9	17	7	17	24	53	70
LACM 7733	135	163	48.5	17.0	11.0	10.0	XI, 18	III, 9	16	5	14	19	49	80
ANSP 87101 1	152	192	55.0	19.5	10.0	13.5	XI, 18	III, 9	16	7	17	24	59	72
USNM 43348	153	186	63.0	20.0	10.5	12.0	XI, 19	III, 9	16	6	17	23	58	79
ANSP 87101 2	155	192	60.0	18.0	11.0	13.0	XI, 18	III, 9	16	7	16	23	61	78
ANSP 113327 2	168	24	62.0	22.5	14.0	14.5	XI, 18	III, 9	16	6	16	22	60	82
ANSP 113327 1	184	230	67.0	24.0	11.5	15.0	XI, 18	III, 9	16	6	16	22	53	70
ZMB 143*	224	-	75.0	24.8	14.7	15.1	XI, 19	III, 9	17	7	16	23	-	76
USNM 33239	230	286	78.0	30.0	16.0	16.0	XI, 19	III, 9	16	5	14	19	60	80

extraction, PCR, and sequencing protocols followed Craig *et al.* (2004). Sequence data were obtained for the mitochondrial cytochrome b, 16S rDNA, and 12S rDNA genes, as well as the nuclear TMO 4C4 gene (2001 total base pairs). Sequence data were added to an existing dataset designed to infer relationships among *Alphestes* and the closely related grouper genus *Dermatolepis* (Craig *et al.*, 2004).

## RESULTS

Total sequence divergence (p) between the São Tomé specimen and *A. afer* from Florida was 0.00454 (9 of 2001 bases), while that between *A. afer* and *A. immaculatus* was 0.04282 (85 of 2001 bases), and between *A. afer* and *A. multiguttatus*, 0.02519 (50 of 2001 bases). Counts and measures for 24 of the 44 specimens examined are presented in table I. Because the original species description lacks much of the detail presented in current species descriptions and the type locality was previously thought to be erroneous, we present a redescription of the species below.

## ALPHESTES AFER (BLOCH, 1793)

(Figs 1, 2)

*Epinephelus afer* Bloch, 1793. - 12, Plate 327 [Original description; holotype ZMB 143, 224 mm SL; type locality Guinea (western Africa)]. Boulenger, 1895: 254 (description based on Western Atlantic specimens; *Serranus armatus* Osório, 1894 listed in synonymy with a question mark; distribution given as “Atlantic coasts of America from West Indies to Falkland Islands; coast of Guinea?”). Smith, 1971 (in part, not eastern Pacific specimens, which are *Alphestes immaculatus* Breder, 1936). Paepke, 1999: 135 (Guinea type locality noted as “wrong”)

*Alphestes afer* Bloch & Schneider, 1801. - 236; Peters, 1865: 105 (examined Bloch’s holotype and synonymized it with the western Atlantic species *Plectropoma chloropteron* and *Plectropoma monacanthus*); Jordan and Swain, 1884: 396 (distribution given as “West Indies”; queried Bloch’s type locality, Guinea); Jordan and Eigenmann, 1890: 350 (description based on Western Atlantic fish; synonymy); Jordan and Evermann, 1896: 1164 (description, synonymy);



Figure 1. - Photograph of *Alphestes afer* taken by P. Wirtz at the São Tomé city fish market (Gulf of Guinea; West Africa). [Photographie d'*Alphestes afer* prise par P. Wirtz au marché aux poissons de São Tomé (golfe de Guinée, Afrique occidentale).]

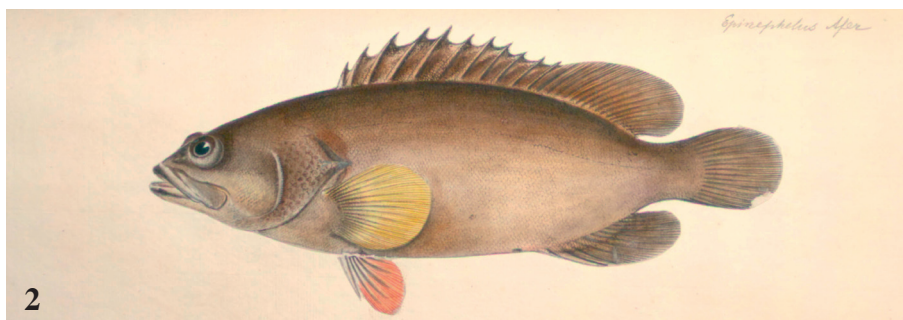


Figure 2. - Original, unpublished drawing of Bloch's (1793) *Epinephelus afer*. (Courtesy of the archives of the Museum für Naturkunde der Humboldt-Universität zu Berlin (ZMB)). [Dessin original de *Epinephelus afer* non publié de Bloch (1793). Planche aimablement fournie par les archives du Musée de la Nature de l'université Humboldt à Berlin (ZMB).]

noted that “only the original type of Bloch recorded from Africa”); Heemstra and Randall, 1993: 20, Pl. I, fig. B, (diagnosis, synonymy, distribution; Bloch's type locality, Guinea said to be erroneous; distinguished from *Alphestes immaculatus* Breder, 1936 and *Alphestes multiguttatus* (Günther, 1867).

*Plectropoma chloropterus* Valenciennes in Cuv. & Val., 1828. - 398 [type locality Dominican Republic and Martinique].

*Plectropoma monacanthus* Müller & Troschel, 1848. - 665 [type locality Barbados].

*Plectropoma afrum* (non Bloch): Günther, 1868. - 411 [misidentification].

*Serranus armatus* Osório, 1894. - 174 (type locality São Tomé).

*Epinephelus lightfooti* Fowler, 1907. - 258, fig. 3 [type locality Santo Domingo, Dominican Republic]

#### Material examined

*Holotype*. - ZMB 143, 212 mm SL, Guinea.

*Other specimens*. - ANSP 83729, Bahamas, 201 mm; ANSP 121416; ANSP 103289; ANSP 87101; ANSP 105415; ANSP 113327, St Lucia, 64-180 mm; FMNH 4838, Bermuda, 253 mm; FMNH 49047, Bermuda, 134 mm; LACM 7733, Puerto Rico, 132 mm; MCZ 9785, Cuba, 6 spms, 136-180 mm; MCZ 9797, Cuba, 191 mm; MCZ 43873, Panama, 130 mm; MZUSP uncataloged, Brasil: Ubatuba, 150 mm; UPR 819, Puerto Rico, 220 mm; UPR 2569, Puerto Rico, 148 mm; USNM 247245; USNM 33239; USNM 43348; USNM 235696, Origin? Size?.

#### Diagnosis

The diagnosis is based on 44 western Atlantic specimens, 24 for which data are presented in table I, and 20 for which data are presented in Heemstra and Randall, 1993 (64-253 mm SL). Data from Bloch's holotype are given in parentheses.

Body depth slightly less than head length, depth contained 2.4-3.1 (2.9) in standard length; caudal peduncle depth contained 7.0-9.0 (8.5) times in SL; eye diameter greater than or equal to snout length and contained 8.1-15.0 (13) times in SL; snout length 10.1-16.0 (16.0) times in SL; preopercle rounded, the posterior edge serrate, with a large antrorse spine at the angle directed downward and forward and usually covered with skin. Gill rakers 5-8 (7) on upper limb, 14-17 (16) on lower limb, 19-25 (23) total, including rudiments. Dorsal fin with XI spines and 17 to 20 (18) soft rays, anal fin with III spines and 9, rarely 10 (9) soft rays; pectoral fins with 16-18 (17) rays; caudal fin rounded, with 15 branched rays. Scales smooth; lateral-line scales 49-66; lateral scale series 68-88 (76). Colour in life: Head, body, and median fins olivaceous or light brown, irregularly blotched and barred with dark brown. Some individuals densely spotted with orange; head, body, and all fins often with scattered white spots; body sometimes covered with scattered small black dots; pectoral fins may be orange or yellow with faint dark reticulations.

#### Description

A small grouper species, rarely reaching greater than 33 cm total length. Meristic counts and morphometric data are presented in table I. Spinous dorsal fin with membranes



slightly incised, the third or fourth spine longest, and soft rays distinctly longer than posteriormost spines. Spinous and soft portion of dorsal fin covered with scales approximately half way up the fin. Pectoral fins reaching beyond pelvics, their origin ahead of pelvic fin origin. Second and third anal-fin spines about equal. Interorbital space with minute, embedded scales extending forward to rear nostrils. Middle opercular spine strongest, often exposed; upper and lower opercular spines covered with skin. Dorsal head profile high, slightly concave in some individuals. Nostrils close together, the anterior nostril in a short tube with rear margin expanded as a short skin flap. Branchiostegal membranes separate, attached to anterior end of isthmus. Gill rakers slender, shorter than gill filaments. Maxilla naked, reaching slightly beyond orbit; teeth on lower jaw with three to five anterior rows and two rows along the lateral edges; a pair of small canines (hidden by lips) on outer edge of tooth bands at front of both jaws; inner teeth near symphysis largest; palatine and vomerine teeth well developed. Belly scaly and lightly pigmented. Anus situated about two-thirds of distance from origin of pelvic fins to origin of anal fin. Lateral line parallel to curvature of dorsal body profile, with two or three pored scales extending onto caudal fin.

### Distribution

Western Atlantic: Bermuda, south Florida, Gulf of Mexico, Bahamas, Cuba, West Indies, Panama, Venezuela, and southward to São Paulo, Brazil. Boulenger's (1895) record of *E. afer* from the Falkland Islands is based on the stuffed specimen reported by Günther (1859). This specimen probably came from Brazil, and was mislabeled or mixed up with specimens from the Falklands. Western Africa: Two specimens, one from the coast of Guinea (holotype) and the specimen reported herein from São Tomé Island (Gulf of Guinea).

## DISCUSSION

While the existence of *Alphestes afer* in the eastern Atlantic has gone unreported for more than two centuries, its presence there is now re-confirmed. While the exact capture locality may be unknown for this specimen, it most certainly came from the eastern Atlantic, most likely from within the Gulf of Guinea. The morphological characteristics of the holotype indicate that Bloch's (1793) description indeed represents *A. afer* of both eastern and western Atlantic populations. The sequence data presented herein confirm that the specimen photographed on São Tomé is conspecific with *A. afer* (Bloch, 1793) based on the extremely low level of sequence divergence (0.4%). This is nearly tenfold less sequence divergence than that seen for the same loci between *A. afer* and the two other described species of *Alphestes* (*A. immaculatus* and *A. multiguttatus*; Craig *et al.*, 2004).

Osório (1894) described *Serranus armatus* as a new species from São Tomé. His description (in French) reads as follows: "Species near *Serranus undulosus* Cuvier, [= *Mycteroperca acutirostris*] but it differs by the following characters. The formula of the fins is D 11/18; A 3/10. The caudal is rounded also the soft part of the dorsal and not truncate as in *S. undulosus*. The serrae at the angle of the preopercle are larger than those on the vertical edge but particularly the hindmost, which is 2 mm long and curved downward and directed anteriorly. The irregular spots on the dorsal surface of the body and flanks have a black margin. The soft dorsal-fin is one and half times higher than the spinous part and the anal fin rays almost two times longer than the anal-fin spines. Colour generally pale reddish brown. A black line extends from suborbital along the upper edge of the maxilla, another less dark line runs from the edge of the suborbital to the angle of the preopercle. Length of the largest of our specimens 12 cm. Habitat: São Tomé."

*Alphestes afer* is the only fish known from the eastern Atlantic that matches Osório's description of *Serranus armatus*. The syntypes of this species were housed at the Museu Bocage in Lisbon but were destroyed by fire in 1978. The species name, preceded by a question mark, was placed in the synonymy of *Epinephelus afer* by Boulenger (1895). Although Fowler (1936: 763) was aware of Boulenger's identification of *Serranus armatus*, he considered the species to be a synonym of *Mycteroperca rubra* as "it seems more nearly to approach the present species." Fowler's re-assignment of *Serranus armatus* was perhaps influenced by the apparent absence or doubtful occurrence of *Alphestes afer* in the eastern Atlantic. Fowler's misidentification of *Serranus armatus* was uncritically accepted by Smith (1990: 702) or doubtfully followed by Heemstra (1991: 53) and Heemstra and Randall (1993: 275).

*Alphestes afer* is apparently rare in the eastern Atlantic; no specimens were reported by Poll (1954) in his extensive trawling survey off the Congo River and northern Angola. And, except for the listing (as *Serranus armatus*) in the synonymy of *Mycteroperca rubra*, it is not reported in the literature on eastern Atlantic groupers (Fowler, 1936; Smith, 1990; Heemstra, 1991).

The Gulf of Guinea appears to be particularly rich in ampho-Atlantic fishes and invertebrates (see Wirtz, 2004 and references therein). Several Atlantic grouper species are known to exist on both sides of this ocean basin (e.g., *Epinephelus adscensionis*, *Epinephelus marginatus*, *Epinephelus itajara*, *Paranthias furcifer*) and there are putative sister species on either side of this basin (e.g., *Mycteroperca rubra* and *M. acutirostris*; cf. Heemstra and Randall, 1993; Luiz-Júnior *et al.*, 2004). Even though planktonic larvae could cross the Atlantic in as little as 35 to 105 days in the Equatorial Undercurrent (Scheltema, 1971), it remains unclear in most cases if the western and eastern Atlantic pop-

ulations of amphi-Atlantic species are still linked genetically today. A genetic study of the fish *Ophioblennius atlanticus* (Valenciennes in Cuvier & Valenciennes, 1836) by Muss *et al.* (2001) suggested that eastern and western Atlantic populations of this species have been genetically distinct for about 5.5 million years and should probably be considered sister species. In contrast, there appears to be ongoing gene flow between American and African populations of the sea urchin *Eucidaris tribuloides* (Lamarck, 1816) (Lessios *et al.*, 1999).

The persistence of amphi-Atlantic species thus poses an interesting biogeographical pattern that is worthy of future studies. The processes that drive these patterns are most likely far more complex than previously thought, and future studies should provide interesting new insights into such wide ranging species and their degree of connectivity.

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